



US005997282A

# United States Patent [19] Man

[11] Patent Number: **5,997,282**  
[45] Date of Patent: **Dec. 7, 1999**

[54] **CHILD-RESISTANT PIEZO-ELECTRIC SAFETY LIGHTER**

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[21] Appl. No.: **09/163,023**

[22] Filed: **Sep. 29, 1998**

[51] Int. Cl.<sup>6</sup> ..... **F23D 11/36**

[52] U.S. Cl. .... **431/153; 431/255**

[58] Field of Search ..... 431/153, 310, 431/255; 222/153.14

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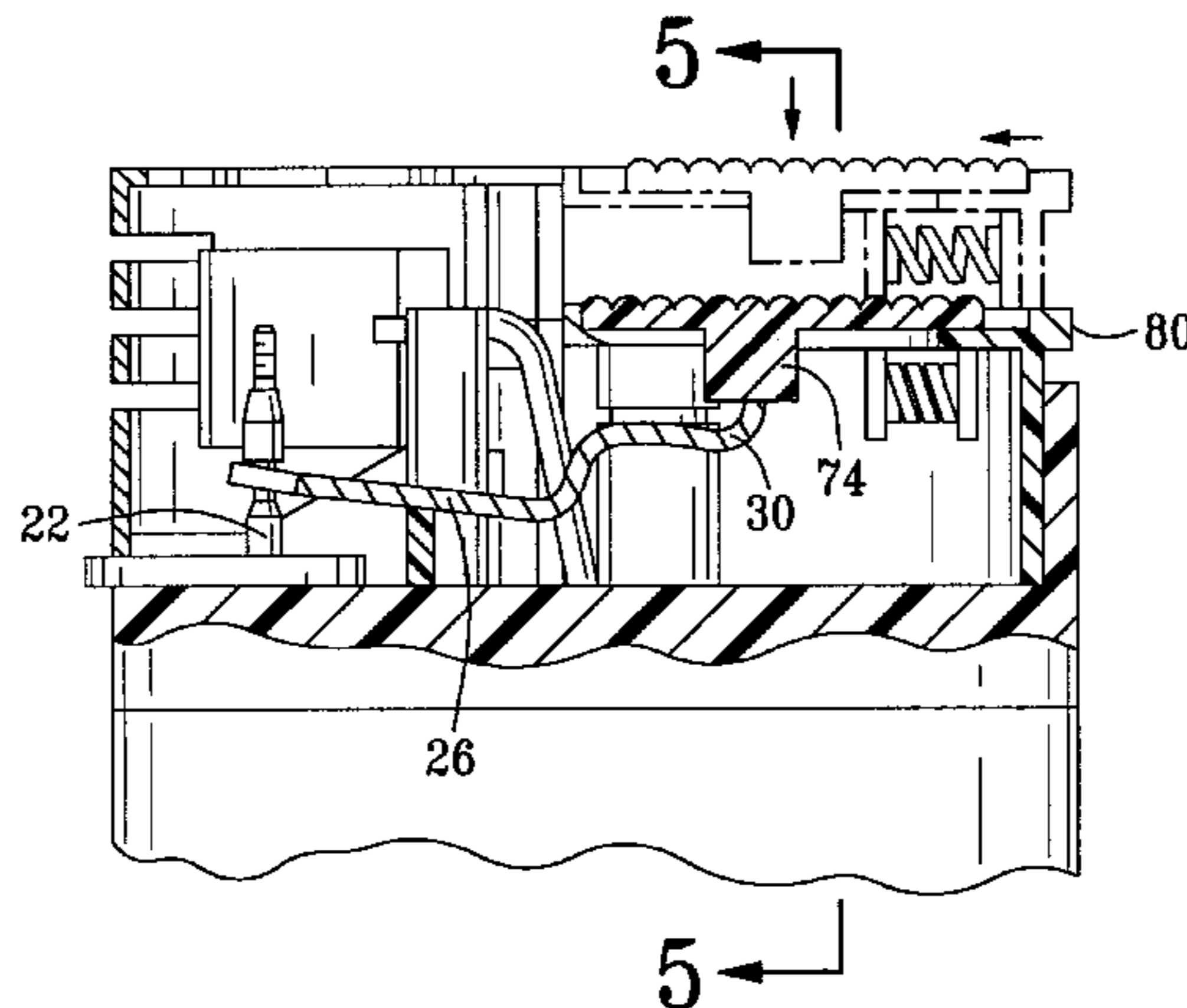
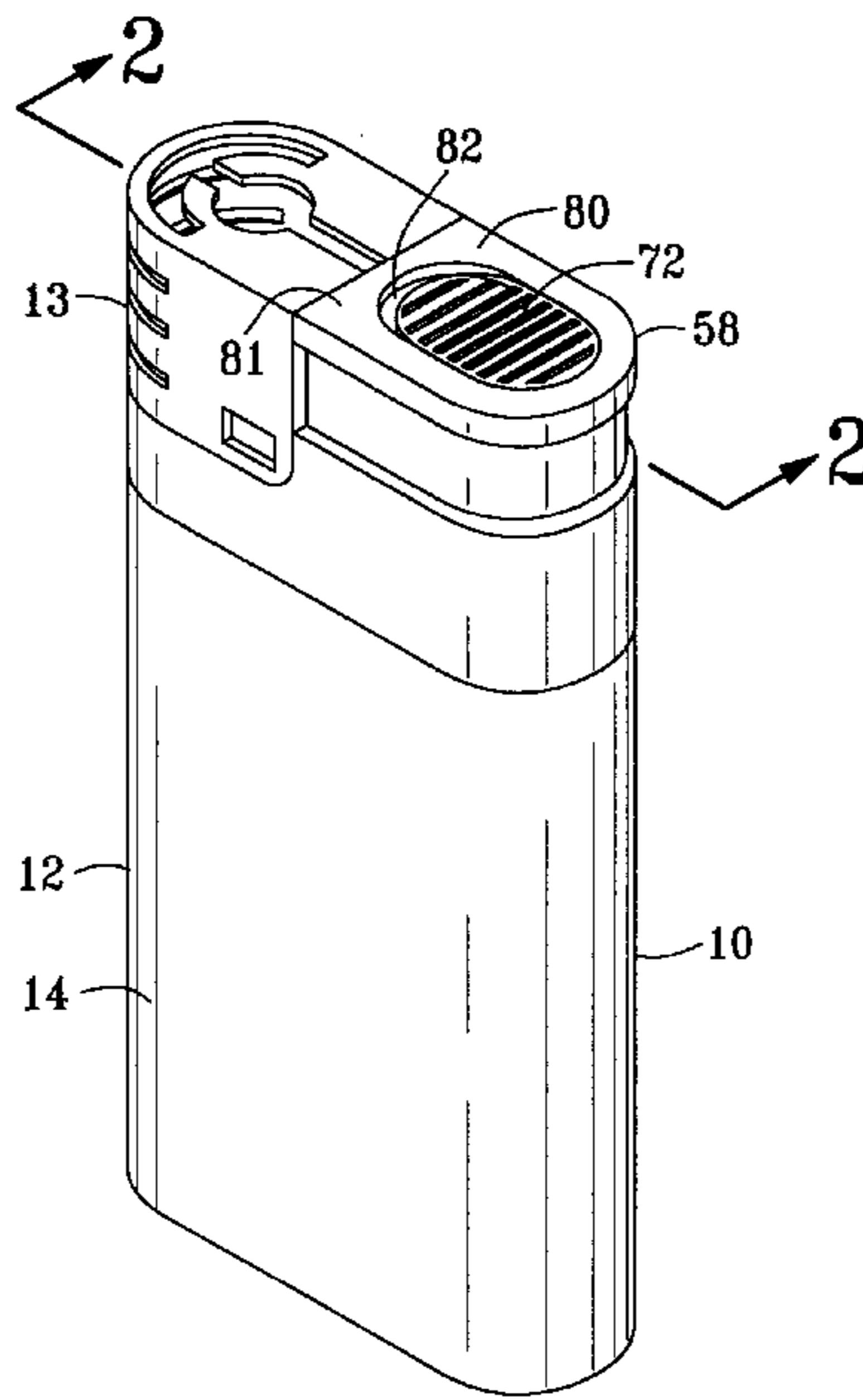
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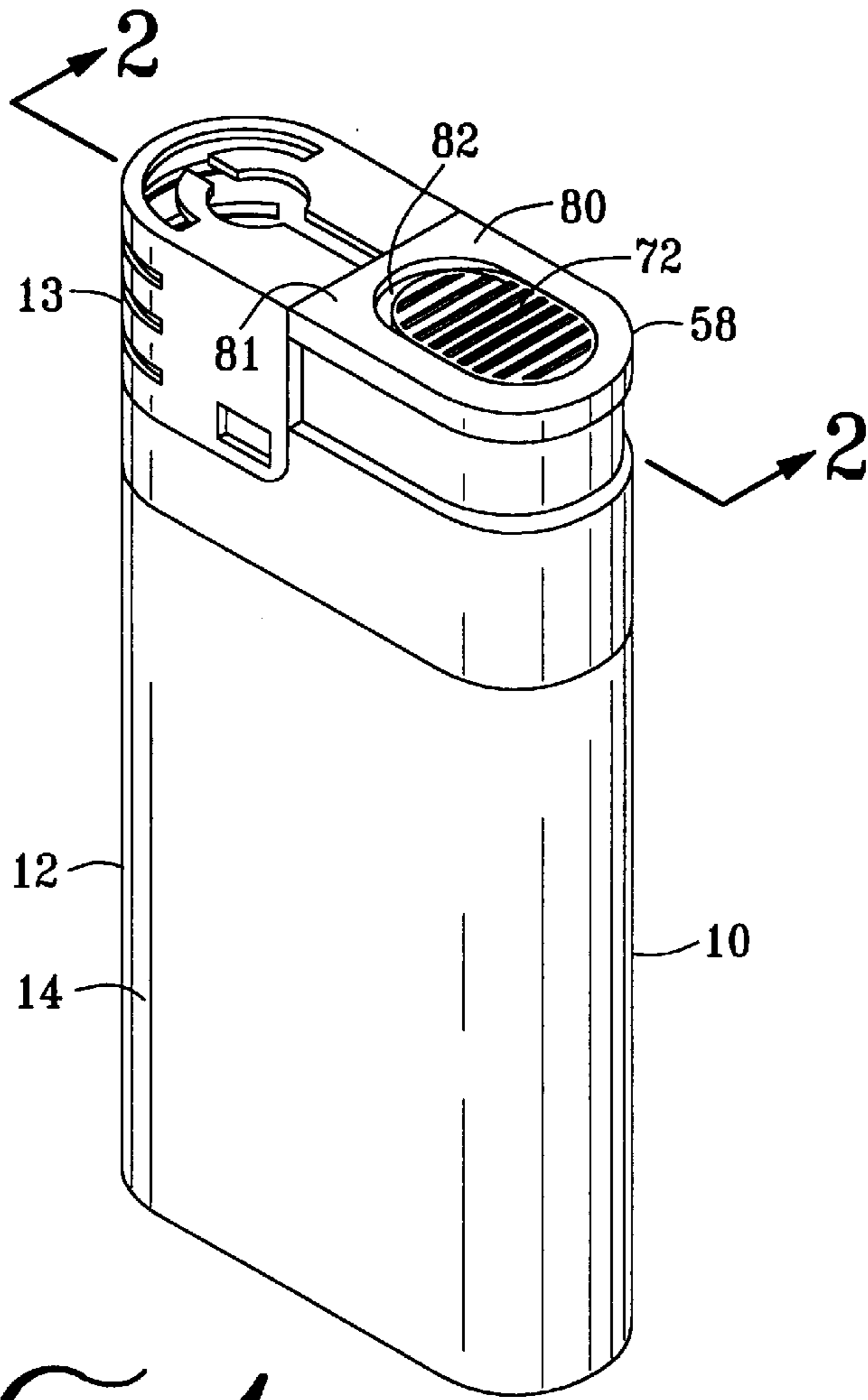
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[57] **ABSTRACT**

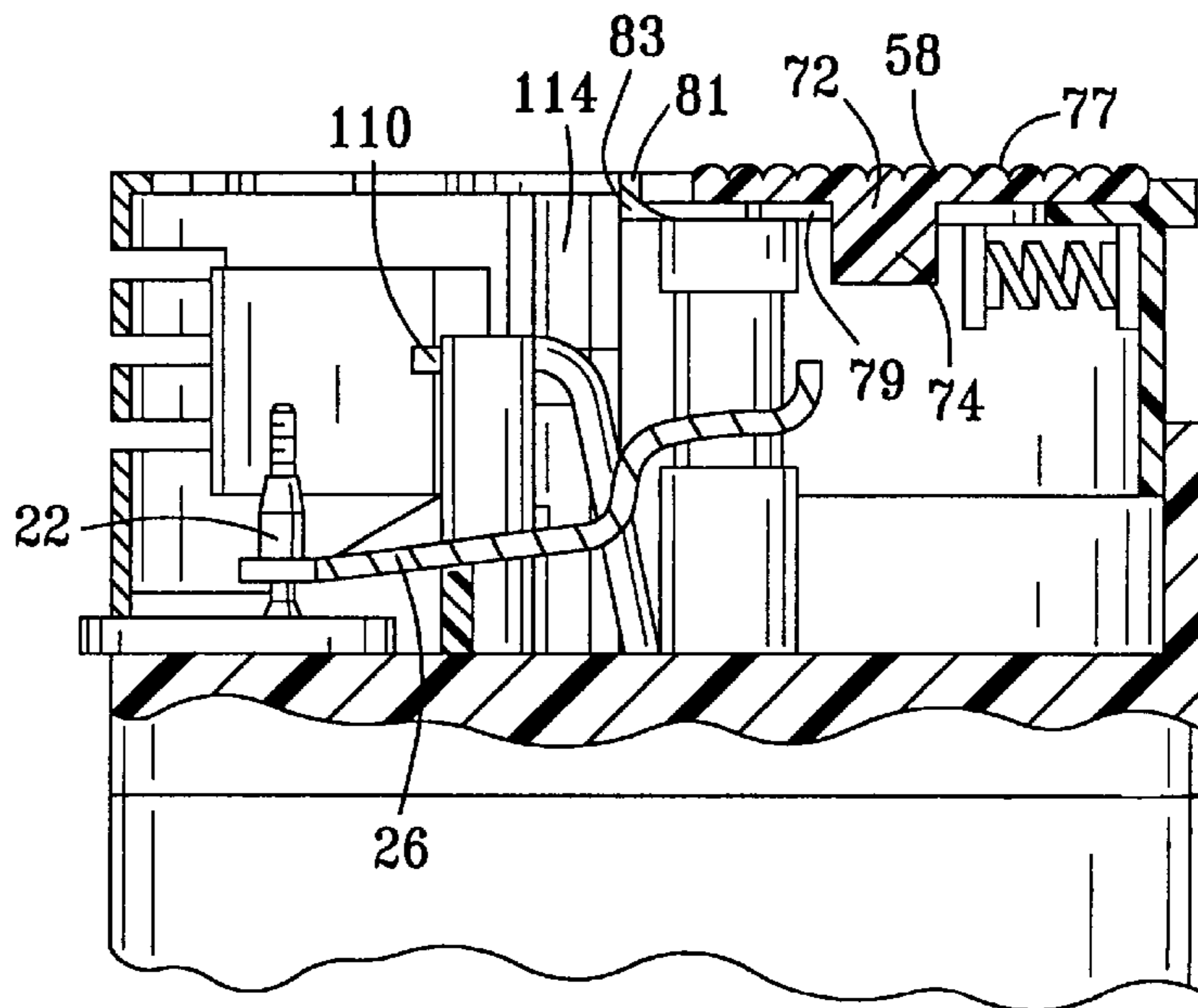
A child resistant lighter comprising a standard piezo-electric lighter construction having a main body, a fuel reservoir, valve release means, and a piezo-electric means, the improvement comprising a child-resistant safety device which includes a safety button which must be moved to an engaged position so that a contacting block will be in place when the operating button is depressed allowing contact and displacement of the release lever which will open the gas valve and allow operation of the lighter.

**21 Claims, 3 Drawing Sheets**

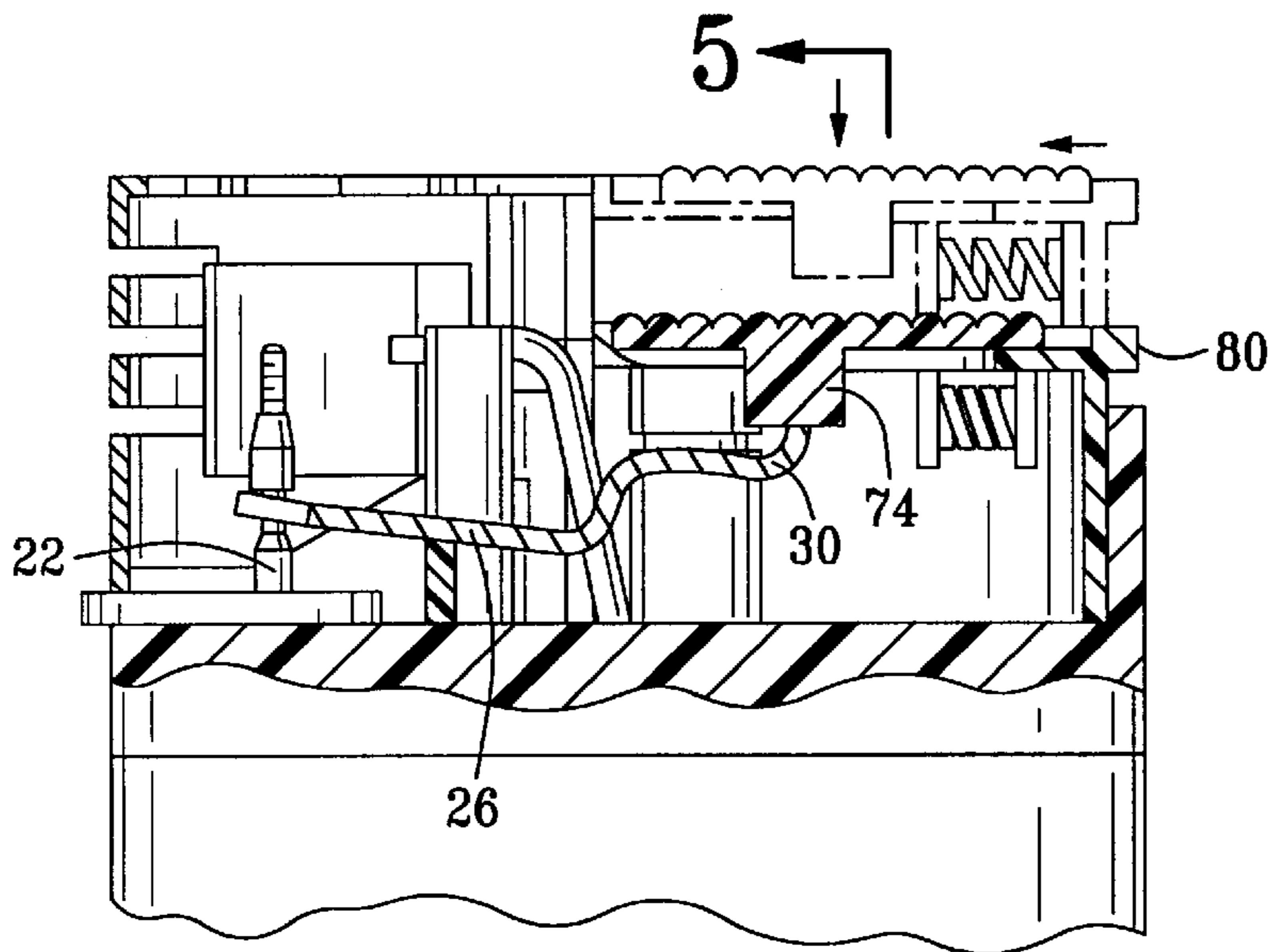




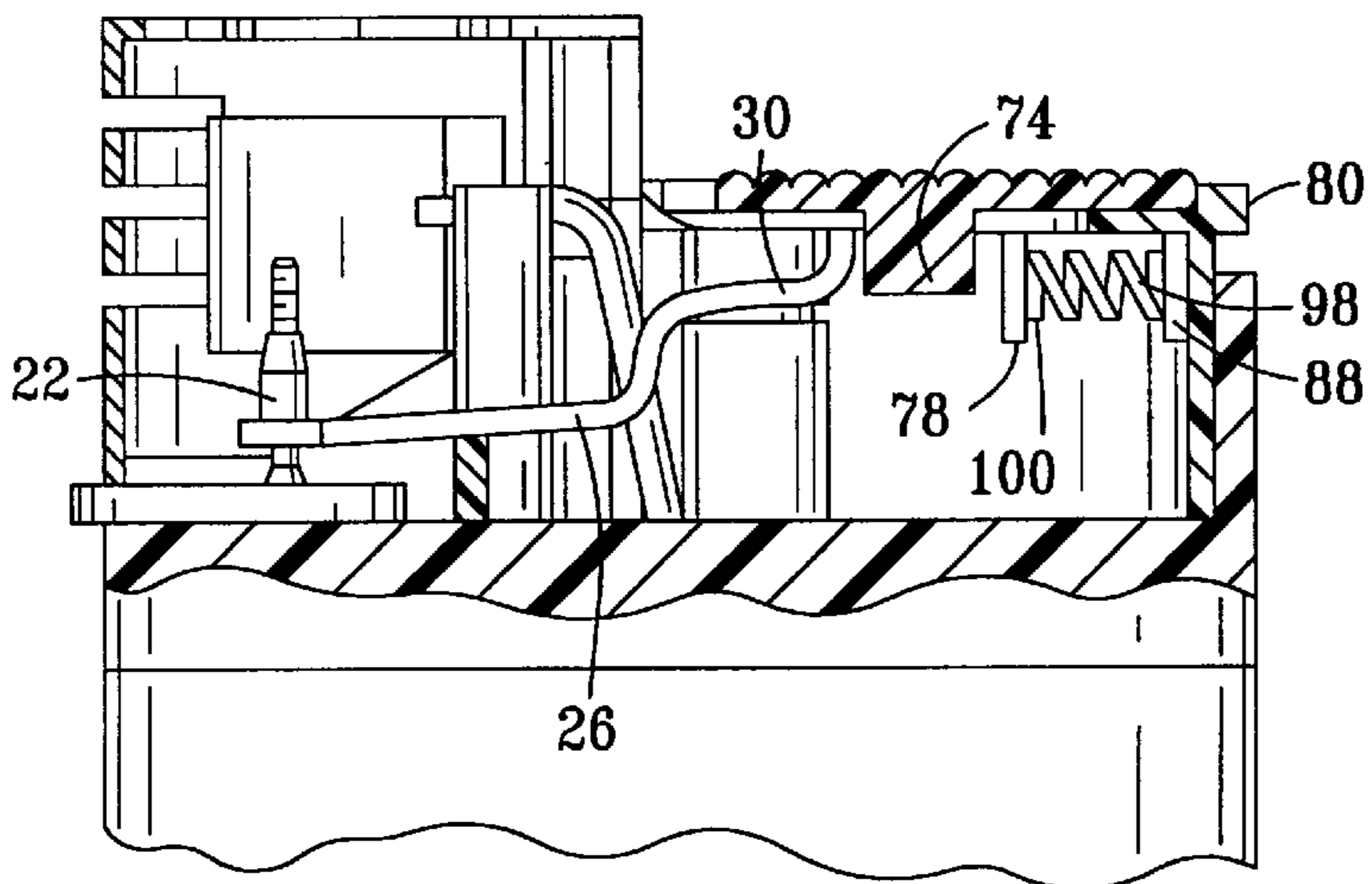
*FIG. 1*



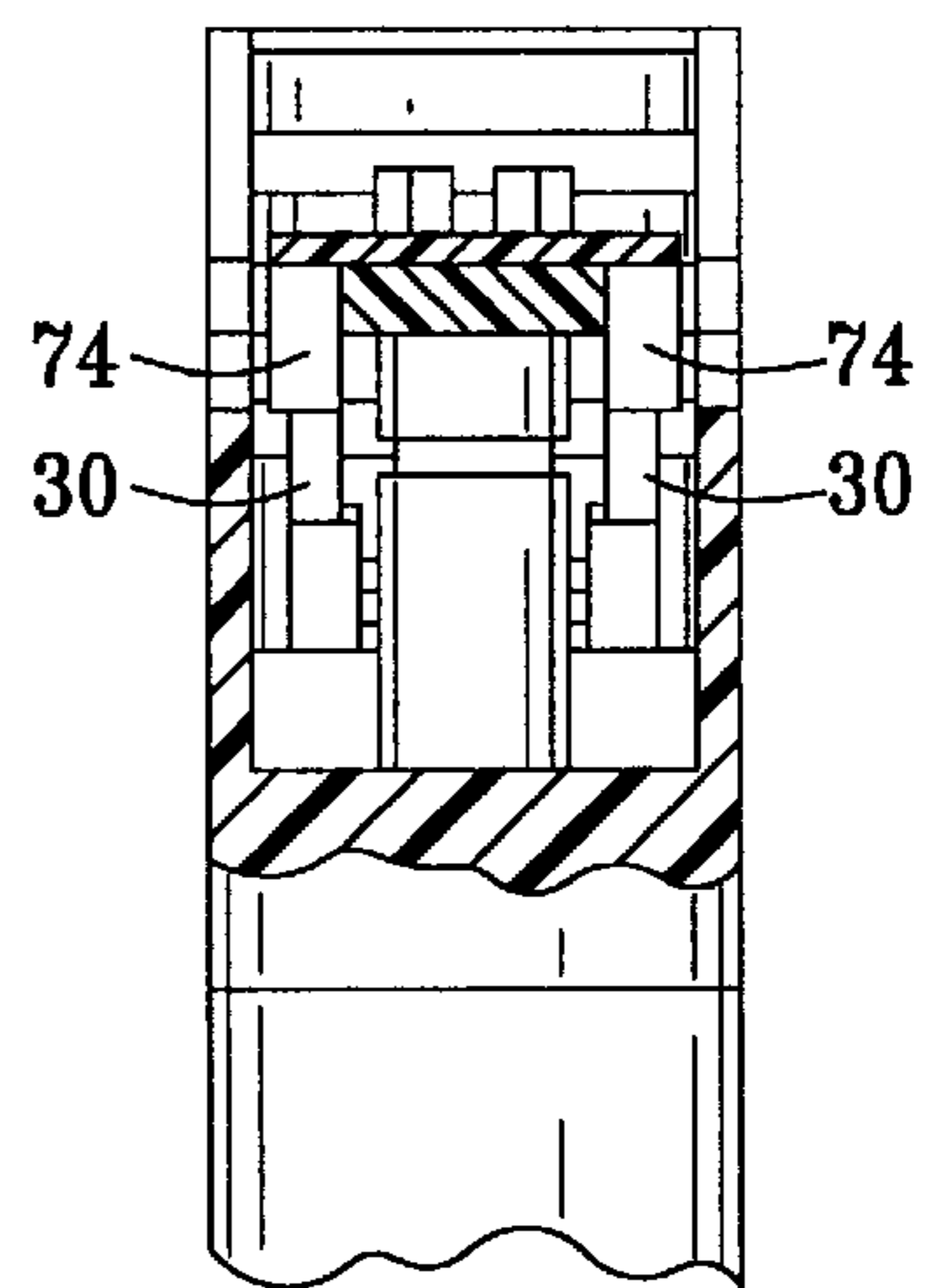
*FIG. 2*



*FIG. 3* 5 ← ↓



*FIG. 4*



*FIG. 5*

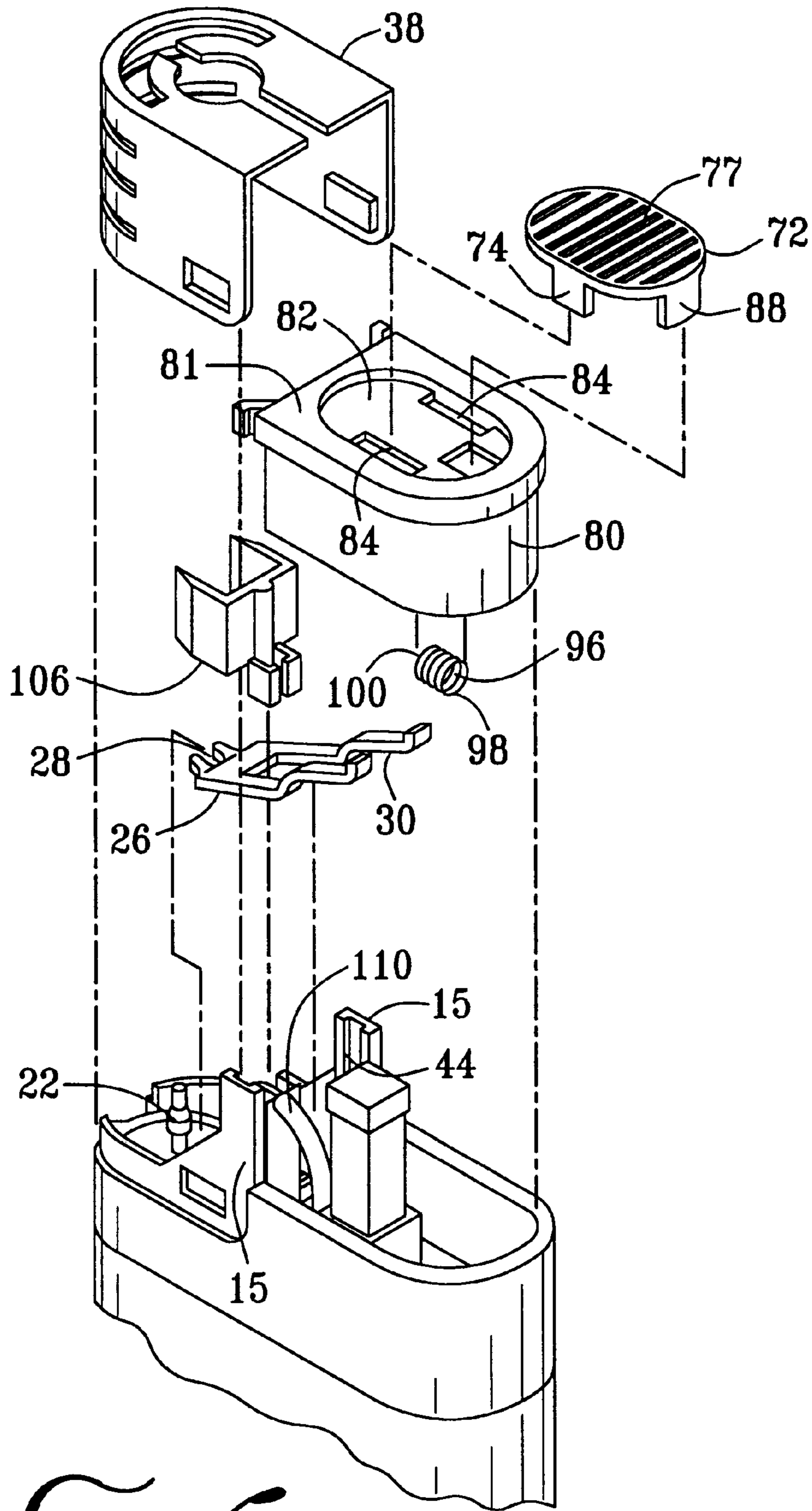


FIG. 6

## CHILD-RESISTANT PIEZO-ELECTRIC SAFETY LIGHTER

### FIELD OF THE INVENTION

This invention relates to child-resistant lighters.

### BACKGROUND OF THE INVENTION

Various prior art cigarette lighters incorporating safety features are known. Safety features are generally provided to reduce the risk of injury to an operator or bystanders. Safety features for cigarette lighters can be divided into several general categories. Some safety mechanisms prevent ignition of a fuel source unless the lighter is properly oriented. Other mechanisms have been designed to automatically turn off a fuel supply valve. More recently, attention has been directed toward preventing ignition of the lighters by children and other persons normally not able to appreciate the danger of fire. Individuals usually considered in these efforts are young children, age five years and younger.

Child tamper-resistant mechanisms have focused on preventing depression of the thumb pad or thumb actuator found in most lighters by incorporating a locking mechanism that physically blocks the downward movement of the thumb pad unless a safety latch or other button is first engaged to unlock the lighter.

However, none of the prior inventions have incorporated a device which allows deflection of the operating button but not the gas release lever. The invention presented here, incorporates a safety button which must be moved to an engaged position and held there during displacement of the operating button. The operating button may be displaced whether the safety button is engaged or not, but the lighter will only release combustible fuel when the safety button is engaged during displacement of the operating button.

This additional step in the normal operation of a piezo-electric lighter will reduce the possibility of use by children. Children may not comprehend the need to move the safety button to its engaged position and maintain this position during depression of the operating button. As such, it is likely that a child will at best depress the operating button without the safety button in an engaged position, with will in turn, not deflect the release lever. Even if a child understands the operation of the child-resistant button device, he/she may not have the strength or manual dexterity to operate the safety button while depressing the operating button.

### SUMMARY OF THE INVENTION

The present invention is directed to a child-resistant lighter which incorporates a safety button which must be moved to an engaged position and held there during displacement of the operating button. The operating button may be displaced whether the safety button is engaged or not, but the lighter will only release combustible fuel when the safety button is engaged during displacement of the operating button.

Likewise, the invention is intended to add additional analytical steps to the child's mental process of understanding the operation of the lighter to further hinder the ability of small children to use the lighter.

These and other objects and advantages of the present invention will become apparent from the following detailed description of the preferred embodiment of the invention without intending to limit the scope of the invention which is set forth in the appended claims.

### DETAILED DESCRIPTION OF THE DRAWINGS

The advantages of the invention can be more clearly understood by reference to the drawings in which:

FIG. 1 is a perspective view of the invention;

FIG. 2 is a side cross-sectional view of the invention with the operating button and the safety button both in their respective initial positions;

FIG. 3 is a side cross-sectional view of the invention with the operating button in its deflected position and the safety button in its engaged position so that the gas release lever will be deflected to cause opening of the gas valve and allow operation of the lighter;

FIG. 4 is a side cross-sectional view of the invention with the operating button in its deflected position and the safety button in its non-engaged position so that the gas release lever can not be deflected and the gas valve will not be opened so that the lighter will not be capable of operating;

FIG. 5 is a rear cross sectional view of the invention showing the operating button fully depressed with the safety button in its engaged position so as to contact and deflect the gas release lever; and

FIG. 6 is an exploded view of the invention.

### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

FIGS. 1 through 6, inclusive, generally illustrate the present invention 10, a child resistant piezo-electric safety lighter, in one of its preferred embodiments. The lighter 10 includes a main housing 12, which contains a standard fuel reservoir 14. The main housing 12 also includes a top end 13 from which support arms 15 project longitudinally.

The top end 13 of the lighter 10 also generally incorporates a piezo-electric ignition mechanism (not shown) secured thereto. As shown in FIGS. 1 through 6, the ignition mechanism includes any standard means for the controlled release of a combustible fuel from reservoir 14. The fuel release means may include a valve 22 connected to a tube (not shown) that draws on fuel in the reservoir 14. The valve 22 is typically moved to the open position by operation of a release lever 26. The release lever 26 has an interior end 28 and an exterior end 30. The interior end 28 has a prong 32 formed therein for engaging the valve 22. The exterior end 30 has an area for contacting a depression mechanism. The release lever 26 also includes hinging means (not shown), mounted to top end 13 thereby permitting lever 26 to pivot when in operation. A standard flame regulator 106 is mounted to top end 13 and positioned and shaped to control airflow and maintain position of a flame. A standard wind screen 38 fits over and encloses the valve 22 and a portion of the support arms 15.

Release lever 26 allows selective actuation between a normally closed valve 22 position, which prevents exit of said combustible fuel from said reservoir 14, and an open position which permits exit of combustible fuel from reservoir 14 through valve 22. Release lever 26 being pivotally mounted so that the exterior end 30 may be deflected by depression of child-resistance safety device 58.

The new and novel improvement of the present invention is the addition of child-resistance safety device 58. Child-resistance safety device 58 comprising operating button 80 and safety button 72. This safety device operates as a child-resistance safety mechanism by requiring the user to move forward safety button 72 to, and maintain it in, an engaged position before and during depressing the operating button 80. Without safety button 72 in its engaged position

during depression of operating button **80** release lever **26** will not be displaced and valve **22** will not open to release the combustible fuel. This additional step in the normal operation of a peizo-electric lighter will reduce the possibility of use by children. Children may not comprehend the need to move safety button **72** to its engaged position an maintain this position during depression of operating button **80**. As such, it is likely that a child will at best depress operating button **80** without safety button **72** in an engaged position, which will in turn, not deflect release lever **26**. Even if a child understands the operation of child resistance safety device **58**, it may not have the strength or manual dexterity to operate safety button **72** while depressing operating button **80**.

Operating button **80** is mounted to lighter housing **12** to allow vertical sliding, having an initial position above a lower depressed position. Operating button **80** is positioned so to contact and cause actuation of the piezo-electric means (not shown) for causing a spark. In turn, the piezo-electric means is mounted to said lighter housing in operational relation with said operating button such that when said operating button is transversed from its initial position to its depressed position the piezo-electric means will cause a spark to be formed between its cathode **110** and its anode (not shown). Cathode **110** and the anode being positioned in a spaced relation to facilitate formation of a spark at or near said valve **22** for ignition of the combustible fuel

Operating button **80** has an upper surface **81** and a lower surface **83**. Upper surface **81** and lower surface **83** defining a pre-determined thickness of said operating button. Also, operating button **80** has a front end and a rear end. Mounting of operating button **80** is done via a pair of opposed vertical rails **114**, which allow operating button **80** to slide vertically. Vertical rails **114** are mounted to the support arms **15** of lighter housing **12**. Operating button **80** being positioned above said release lever **26** such that when operating button **80** is transversed from its initial position to its depressed position, the lower surface **83** will come to rest at a position less than necessary to contact and deflect the exterior end **30** of release lever **26** to an extent necessary to open valve **22**. As such, preventing release of the combustible fuel and prohibiting operation of lighter **10**.

A portion of upper surface **81** is shaped to define an elongated recess **82** running from the front to the rear of the upper surface **81**. Further, upper surface **81** contains a pair of pass-through slots **84** positioned within recess **82** and aligned front to rear of operating button **80**.

A safety button **72** has a top **77** and bottom surface **79**. Safety button **72** is slidably mounted within recess **82** and positioned as to be actuatable by a user. Safety button **72** is sized to freely slide within recess **82** from its initial position to its engaged position. A pathway is defined by the translation of safety button **72** between its initial and engaged positions. A pair of contact blocks **74** depend downward from the bottom **79** of safety button **72** a pre-determined length. The contact blocks **74** are sized to pass through slots **84**, and shaped and located so that in the initial position of safety button **72**, as shown in FIG. **4**, the contacting blocks **74** are positioned so that when operating button **80** is transversed to its depressed position the contacting blocks **74** pass by the exterior end **30** of release lever **26** so that release lever **26** remains stationary. Likewise, as shown in FIGS. **3** and **5**, with safety button **72** in its engaged position, the contacting blocks **74** are positioned so that when operating button **80** is depressed the contacting blocks **74** contact the exterior end **30** of the release lever **26** causing release lever **26** to translate with operating button **80** a distance sufficient to cause opening of said valve **22**.

The child-resistance safety device **58** further comprises a horizontally mounted spring **96** having a first end **98** and a horizontally opposed second end **100**. Spring **96** is biased between safety button **72** and operating button **80** to cause safety button **72** to return to its initial position upon displacement therefrom. First end **98** is received by spring prong **88** which depends from the lower surface **83** of safety button **72**. Positioned opposing and in operating relation to spring prong **88** is spring prong **78**. Spring prong **78** receives second end **100** of spring **96**. Spring prong **78** depends downward from operating button **80**. Spring **96** is held in compression between the spring prong **78** and spring prong **88** such that spring **96** applies an equal and opposite force to each such prong causing safety button **72** to be returned to its initial position upon any displacement therefrom.

The exterior end **30** of release lever **26** is Y-shaped having two ends opposite to valve **22** which are positioned to receive each contact block **74** of safety button **72**.

The top surface **77** of safety button **72** may comprise a non-slip surface for receiving and preventing slippage of the users thumb.

Although the present invention has been described in considerable detail with reference to certain preferred versions thereof, other versions are possible. Therefore, the spirit and scope of the appended claims should not be limited to the description of the preferred versions contained herein.

What is claimed is:

1. A child-resistant peizo-electric lighter having a lighter housing defining a reservoir for containing a combustible fuel, a fuel release means in communication with said reservoir, including a valve cooperating with a release lever for selective actuation between a normally closed valve position, which prevents exit of said combustible fuel from said reservoir, and an open position which permits exit of combustible fuel from said reservoir through said valve, said release lever being pivotally mounted so that a first end, opposite to said valve, may be deflected by depression of an operating button, said operating button being slidably mounted to said lighter housing and having an initial position and a depressed position, and positioned so to contact and cause actuation of said release lever and a piezo-electric means for causing a spark, said piezo-electric means mounted to said lighter housing in operational relation with said operating button such that when said operating button is transversed from its initial position to its depressed position said release lever will deflect sufficiently to open said valve and release combustible fuel just prior to said piezo-electric means causing a spark, said piezo-electric means having a cathode and an anode positioned in a spaced relation to facilitate formation of a spark at or near said valve for ignition of said combustible fuel, the improvement comprising:

said operating button and said release lever being positioned in a spaced relation such that when said operating button is transversed from its initial position to its depressed position, deflection of said release lever is less than that necessary to open said valve,

a safety button slidably mounted on said operating button as to be actuatable by a user and having an initial position and an engaged position, a pathway being defined by translation of said safety button between its initial and engaged positions, said safety button having a contact block depending downward a pre-determined length and shaped and located so that in said initial position said contacting block is positioned so that when said operating button is transversed to its

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depressed position said contacting block passes by the first end of said release lever so that said release lever remains stationary, and so that said contacting block in said engaged position is positioned so that when said operating button is depressed said contacting block contacts the first end of said release lever causing said release lever to translate with said operating button a distance sufficient to cause opening of said valve.

2. A child-resistant peizo-electric lighter as in claim 1 further comprising a resilience means biased between said operating button and said safety button, for slidably returning said safety button to its initial position upon displacement therefrom.

3. A child-resistant peizo-electric lighter as in claim 2 wherein:

said resilience means is a horizontally mounted spring having a first end and a horizontally opposed second end;

said operating button further comprises a spring mount means for receiving and retaining the first end of said spring; and

said safety button further comprises a spring mount means for receiving and retaining the second end of said spring.

4. A child-resistant peizo-electric lighter as in claim 1 wherein:

said operating button further comprises an upper surface having, about the area of translation of contact blocks of said safety button, a thickness less than the downward length of said contact block; and

said safety button is substantially horizontally slidably mounted to the upper surface of said operating button.

5. A child-resistant peizo-electric lighter as in claim 4 wherein said safety button further comprises an additional downwardly depending contact block, said contact blocks opposingly mounted from each other about the pathway of said safety button and extending below the upper surface of said operating button.

6. A child-resistant peizo-electric lighter as in claim 5 wherein the upper surface of said operating button is shaped to define two pass-through slots positioned about and aligned with the pathway of said safety button and sized to receive said contact blocks of said safety button and allow translation of said safety button from its initial to its engaged position.

7. A child-resistant peizo-electric lighter as in claim 6 wherein a portion of the upper surface of said operating button is shaped to define an elongated recess, the recess being sized and shaped to receive said safety button in its initial position, engaged position and therebetween, such that said safety button will slide freely along and within the recess.

8. A child-resistant peizo-electric lighter as in claim 7 wherein said safety button further comprises a top side, the top side having a non-slip surface for receiving and preventing slippage of a user's thumb.

9. A child-resistant peizo-electric lighter having a lighter housing defining a reservoir for containing a combustible fuel, a fuel release means in communication with said reservoir, including a valve cooperating with a release lever for selective actuation between a normally closed valve position, which prevents exit of said combustible fuel from said reservoir, and an open position which permits exit of combustible fuel from said reservoir through said valve, said release lever being pivotally mounted so that a first end, opposite to said valve, may be deflected by depression of an

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operating button, said operating button being slidably mounted to said lighter housing and having an initial position and a depressed position, and positioned so to contact and cause actuation of said release lever and a piezo-electric means for causing a spark, said piezo-electric means mounted to said lighter housing in operational relation with said operating button such that when said operating button is transversed from its initial position to its depressed position said release lever will deflect sufficiently to open said valve and release combustible fuel just prior to said piezo-electric means causing a spark, said piezo-electric means having a cathode and an anode positioned in a spaced relation to facilitate formation of a spark at or near said valve for ignition of said combustible fuel, the improvement comprising:

said operating button further comprising an upper surface and a rear and front ends, said operating button being slidably mounted at its front end to said lighter housing;

said operating button and said release lever being positioned in a spaced relation such that when said operating button is transversed from its initial position to its depressed position, deflection of said release lever is less than that necessary to open said valve; and

a safety button slidably mounted on the upper surface of said operating button as to be actuatable by a user and having an initial position and an engaged position, a pathway being defined by translation of said safety button between its initial and engaged positions, said safety button having a contact block depending downward a pre-determined length and shaped and located so that in said initial position said contacting block is positioned so that when said operating button is transversed to its depressed position said contacting block passes by the first end of said release lever so that said release lever remains stationary, and so that said contacting block in said engaged position is positioned so that when said operating button is depressed said contacting block contacts the first end of said release lever causing said release lever to translate with said operating button a distance sufficient to cause opening of said valve means.

10. A child-resistant peizo-electric lighter as in claim 9 further comprising a resilience means biased between said operating button and said safety button, for slidably returning said safety button to its initial position upon displacement therefrom.

11. A child-resistant peizo-electric lighter as in claim 10 wherein:

said resilience means is a horizontally mounted spring having a first end and a horizontally opposed second end;

said operating button further comprises a spring mount means for receiving and retaining the first end of said spring;

said safety button further comprises a spring mount means for receiving and retaining the second end of said spring.

12. A child-resistant peizo-electric lighter as in claim 11 wherein:

said operating button further comprises a lower surface directly below the upper surface;

the spring mount means of said operating button is a prong depending downward from the lower surface of said operating button, said operating button prong having a surface shaped to receive the first end of said spring; and

the spring mount means of said safety button is a prong depending downward from said safety button, said safety button prong having a surface shaped to receive the second end of said spring, the surface of said safety button prong being positioned opposing the surface of said operating button prong and in an operational relation such that said spring is held in compression between the surface of said operating button prong and the surface of said safety button prong, such that the spring applies an equal and opposite force to each such prong causing said safety button to be returned to its initial position upon any displacement therefrom.

**13.** A child-resistant peizo-electric lighter as in claim 12 wherein:

a portion of the upper surface of said operating button is shaped to define an elongated recess running from the front to the rear of the upper surface; and

said safety button, is mounted and sized to freely slide within said recess from its initial position to its engaged position.

**14.** A child-resistant peizo-electric lighter as in claim 13 wherein said operating button is shaped to define a pass-through slot running along the pathway of said safety button, align from to rear, said slot sized to receive the contact block of said safety button in its initial and engaged positions.

**15.** A child-resistant peizo-electric lighter as in claim 14 wherein:

said safety button further comprises an additional downwardly depending contact block, said contact blocks opposingly mounted from each other about the pathway of said safety button and extending below the upper surface of said operating button; and

said operating button further comprises a pair of pass-through slots sized to receive each of the contact blocks of said safety button.

**16.** A child-resistant peizo-electric lighter as in claim 15 wherein said safety button further comprises a top side, the top side having a non-slip surface for receiving and preventing slippage of a user's thumb.

**17.** A child-resistant peizo-electric lighter having a lighter housing defining a reservoir for containing a combustible fuel, a fuel release means in communication with said reservoir, including a valve cooperating with a release lever for selective actuation between a normally closed valve position, which prevents exit of said combustible fuel from said reservoir, and an open position which permits exit of combustible fuel from said reservoir through said valve, said release lever being pivotally mounted so that a first end, opposite to said valve, may be deflected by depression of an operating button, said operating button being slidably mounted to said lighter housing and having an initial position and a depressed position, and positioned so to contact and cause actuation of said release lever and a piezo-electric means for causing a spark, said piezo-electric means mounted to said lighter housing in operational relation with said operating button such that when said operating button is transversed from its initial position to its depressed position said release lever will deflect sufficiently to open said valve and release combustible fuel just prior to said piezo-electric means causing a spark, said piezo-electric means having a cathode and an anode positioned in a spaced relation to facilitate formation of a spark at or near said valve for ignition of said combustible fuel, the improvement comprising:

said operating button having an upper surface and a lower surface, the upper and lower surfaces defining a pre-

determined thickness of said operating button, said operating button also having a front end and a rear end; said operating button being slidably mounted at its front end upon a pair of opposed vertical rails, said vertical rails being mounted to said lighter housing, said operating button being positioned above said release lever such that when said operating button is transversed from its initial position to its depressed position, the lower surface of said operating button will come to rest at a position less than necessary to contact and deflect the first end of said release lever to an extent necessary to open said valve, thereby preventing release of the combustible fuel and prohibit operation of said lighter;

a portion of the upper surface of said operating button being shaped to define an elongated recess running from the front to the rear of the upper surface, said upper surface being shaped to define a pass-through slot positioned within the recess and aligned front to rear of said operating button,

a safety button, having a top and bottom surface, slidably mounted within the recess of said operating button, positioned as to be actuatable by a user and sized to freely slide within said recess from an initial position to an engaged position, a pathway being defined by translation of said safety button between its initial and engaged positions, said safety button having a contact block depending downward from the bottom surface of said safety button a pre-determined length, sized to pass through the slot of said operating button, and shaped and located so that in the initial position of said safety button said contacting block is positioned so that when said operating button is transversed to its depressed position said contacting block passes by the first end of said release lever so that said release lever remains stationary, and so that said contacting block in the engaged position of said safety button is positioned so that when said operating button is depressed said contacting block contacts the opposing end of said release lever causing said release lever to translate with said operating button a distance sufficient to cause opening of said valve.

**18.** A child-resistant peizo-electric lighter as in claim 17 further comprising:

a horizontally mounted spring having a first end and a horizontally opposed second end;

wherein said operating button further comprises a spring mount means for receiving and retaining the first end of said spring;

wherein said safety button further comprises a spring mount means for receiving and retaining the second end of said spring.

**19.** A child-resistant peizo-electric lighter as in claim 18 wherein:

said operating button further comprises a lower surface below the upper surface;

the spring mount means of said operating button is a prong depending downward from the lower surface of said operating button, said operating button prong having a surface shaped to receive the first end of said spring; and

the spring mount means of said safety button is a prong depending downward from said safety button, said safety button prong having a surface shaped to receive the second end of said spring, the surface of said safety button prong being positioned opposing the surface of said operating button prong and in an operational



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relation such that said spring is held in compression between the surface of said operating button prong and the surface of said safety button prong, such that the spring applies an equal and opposite force to each such prong causing said safety button to be returned to its initial position upon any displacement therefrom. 5

**20.** A child-resistant piezo-electric lighter as in claim **17** wherein:

said safety button has two downward depending contact blocks positioned opposingly about the pathway of said safety button; 10

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said operating button has two pass-through slots positioned and sized to receive each of the contact blocks of said safety button;

said release lever is Y-shaped having two ends opposite to said valve positioned to receive each contact block of said safety button.

**21.** A child-resistant piezo-electric lighter as in claim **20** wherein the top surface of said safety button further comprises a non-slip surface for receiving and preventing slippage of a user's thumb.

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